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Drowsy Driver Detection Using Haar and PAC

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ABSTRACT

Drowsy driver detection system is one of the potential applications of intelligent vehicle systems. Previous approaches to drowsiness detection primarily make pre-assumptions about the relevant behavior, focusing on blink rate, eye closure, and yawning. Driver drowsiness contributes to many car crashes and fatalities in our country. Machine learning algorithms have shown to help in detecting driver drowsiness. In our proposed method Haar classifier and Probably Approximately Correct(PAC)are used for detecting driver drowsiness. It is one of the few object detection methods with the ability to detect faces. Haar classifier used for face recognition most probably eye detection and can optimize frequently used face measures by using PAC. The main idea behind this method is to develop a system which can detect fatigue of the driver and issue a timely warning. Existing method reveals that 78%, 68% and 68% accuracy by using SVM, Naive Bayes and PERCLOS algorithm. Our proposed method reveals that 89% and 84.6% accuracy respectively by using Haar and PAC algorithm. Its seems to be that our proposed methods are better than the existing method.

Keywords: Drowsiness Detection; facial expression; Machine learning; PAC; Haar classifier.

I. INTRODUCTION

Our proposed method discussing about prediction of driver drowsiness using machine learning algorithm. National Highway Safety Administration reports that almost 36,061 fatal vehicle crashes happen in each year. Alcohol intoxication, distraction and drowsiness have a considerable proportion in these crashes (by respectively 31%, 29%, and 2.5%). However, lack of physical traceability of distraction and drowsiness cause their roles to be underestimated. Each year more than 80,000 crashes occur in Nation's highways because of drowsy driving and result at least 850 fatalities and many injuries. Using data from the 100-car naturalistic study, researchers have found that drowsy driving is the reason of 22% to 24% of crashes and near-crashes observed. National Sleep Foundation's 2012 annual Sleep in survey shows that 20 percent of workers had driven drowsy at least once per month in the past year. Approximately 40 percent of train operators said they have driven drowsy at least once in the past month. More than 25 percent of those who had driven drowsy had fallen asleep. Studies show that sleepiness can impair driving performance as much as or more than alcohol.

Prior research in alcohol impairment detection shows that the machine learning algorithms can help to prevent and reduce these crashes and their consequences. The difference between an impaired driver from an unimpaired driver can be recognized reliably by these algorithms with use of driving performance metrics based on signature pattern of lane position and steering. In this method, given a set of driving runs by drowsy and non-drowsy drivers our try to detect the drowsy drivers and thus are more amenable to use by the general public.

II. RELATED WORKS

Mkhuseli Ngxande,Jules-Raymond Tapamo, Michael Burke[1] proposed driver drowsiness detection based on

behavioral measures using machine learning techniques. There are many facial features that can be extracted from the face to infer the level of drowsiness. These include eye blinks, head movements and yawning. As a result, this paper reviews machine learning techniques which include support vector machines, convolutional neural networks and hidden Markov models in the context of drowsiness detection.

Mohammad Amin Assari, Mohammad Rahmati[2] proposed a hardware system which is based on infrared light and can be used in resolving these problems. In the proposed method, determine the face region using the background subtraction technique, the facial components are obtained by horizontal projection and template matching.

A.R. Beukman, G.P. Hancke and B.J. Silva[3] proposed a multi-sensor system for driver fatigue detection. The system achieves this by monitoring eye closure and wheel steering movements, and is able to alert the driver of any detected anomalies. Various techniques are suggested for registering the location coordinates. If it is detected that the driver is falling asleep, the system alerts the driver through audible and visual cues and sends an SMS to a third party reporting the occurrence.

Bagus G. Pratama, Igi Ardiyanto, Teguh B. Adji[4] proposed the ratio of accidents caused by drowsiness, so they propose various features such as visual, non-visual, and vehicular. Visual features are extracted from driver's face and recorded by camera. Non-visual features are signals emerged from driver's body and to acquire those signals, they use special sensor attached to driver's body. Vehicular features are obtained by observing the behaviour of driver during driving. From those features they discussed 3 ideas that can be considered as guidance to lead researcher in developing drowsiness detection. The first idea is creating the dataset of drowsiness facial expression because it can predict drowsiness and fatigue. Second idea is to combine visual, non-visual, and vehicular features into one for better detection. And last one is developing wearable hardware's such as smart watch for drowsiness detection which are easy to use and user friendly.

Ashish Kumar,Rusha Patra[5] proposed a real time driver's drowsiness detection system developed with acceptable accuracy. In the developed system, a webcam records the video and driver's face is detected in each frame employing image processing techniques. Facial landmarks on the detected face are pointed and subsequently the eye aspect ratio, mouth opening ratio and nose length ratio are computed and depending on their values, drowsiness is detected based on developed adaptive thresholding.

Taro Nakamura, Akinobu Maejima, Shigeo Morishim[6] proposed a method for the estimation of the degree of a driver's drowsiness on basis of changes in facial expressions captured by an IR camera. Typically, drowsiness is accompanied by falling of eyelids. In this paper, they propose a more precise drowsiness-degree estimation method considering wrinkles change by calculating local edge intensity on faces that expresses drowsiness more directly in the initial stage.

Javed Ahmed,Jian-ping li, Saeed ahmed kran, Riaz ahmed shaikr[7] proposed to locate the eyes of driver, and to decide whether the eyes of driver are open or close. The system manages utilizing data gained for the image which is in binary form to locate the face edges, which gets the location where the eyes of a person may exist. If the eyes of driver are found close for five successive frames, the system assures that the driver is nodding off and a signal of warning has been issued. The result demonstrates that eye-tracking drowsiness functions admirably for a few drivers the length of the squint acknowledgment works appropriately. The camera based drowsiness measures give an appreciated contribution.

III. METHODOLOGY

In the project of driver drowsiness detection our use Haar cascade classifier for detecting driver drowsiness very accurately and with less false positive rate. In the algorithm has to express the face detection method on it is described.

Haar cascade classifier algorithm:

Step1: Load the required XML classifiers.
Step2: Load our input video in grayscale mode.
Step3: Find the faces in the image. If faces are found, it returns the positions of detected faces as Rect (x,y,w,h).
Step 4: Get the locations and create a ROI (Region of interest) for the face and apply eye detection on this ROI.
Step 5: End

It is a machine learning based approach where a cascade function is trained using XML files. Driver Drowsiness Detection is to capture a driver's face from a camera and

be able to accurately calculate the level of drowsiness. For video manipulation, choose OpenCV library. Then video load in grayscale mode. Driver Drowsiness Detection requires a video sensor to detect the faces of drivers. To detect a driver's face is the Haar Cascade Classifier. It is one of the few object detection methods with the ability to detect faces. Region of interest (ROI) can detect a driver's face with increased accuracy. The way to create an ROI area is to first obtain the rectangle area from the Haar Cascade Classifier, which includes height, width, and the points of x and y. The rectangle is scaled up to create region of interest. If the eye is detected, then check whether the eye is opened or closed. Then checking the criteria for judging drowsiness. That is thus the eyes is closed for more than 20sec it means that driver is in drowsy state. So the alarm starts to beep.

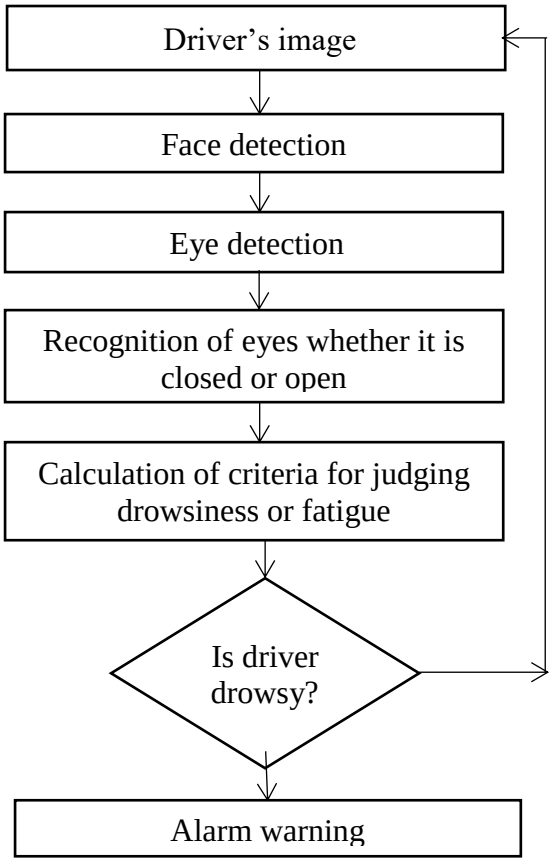

Fig 1: Work flow of driver drowsiness detection

IV.RESULTS AND DISCUSSION

This section describes the results of both proposed and existing system. Various machine learning techniques are used to detect driver drowsiness. SVM, Naive Bayes, PERCLOS are used in the existing system and Haar classifier algorithm and PAC are used in proposed system to detect drowsiness. By comparing these two systems (Existing and proposed systems), proposed system depicts accurate results than existing system.

	Algorithm	Accuracy
Existing system	SVM	78%
	Naive Bayes	68%
	PERCLOS	68%
Proposed system	HAAR	89%
	PAC	84.6%

Table 1: Existing Vs proposed system

The device needs a very accurate eye detector that could be integrated into their system. On their dataset, the Haar-based eye detector, that is bundled with OpenCV had an accuracy of about 89%. In other words, 11% of the time the eye detector failed either the location of the detected eyes were wrong, or there were more than or fewer than two eyes detected.

V.CONCLUSION

From this method, it has been proven that Haar classifier algorithm provides perfect results as compared to other algorithms. This paper presented a system for automatic detection of driver drowsiness and has a new method to detect the eyes and judge the eyes state for fatigue detection. In current methods, when eyes were opened, the eyes position can be detected. At the same time judge the state of the eyes, if eyes were closed for 20 sec then the alarm starts to beep until the driver open the eyes. Distance between driver and camera is in the range 30cm to 80cm. Experimental result shows that the proposed method has 85% accuracy**.**

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